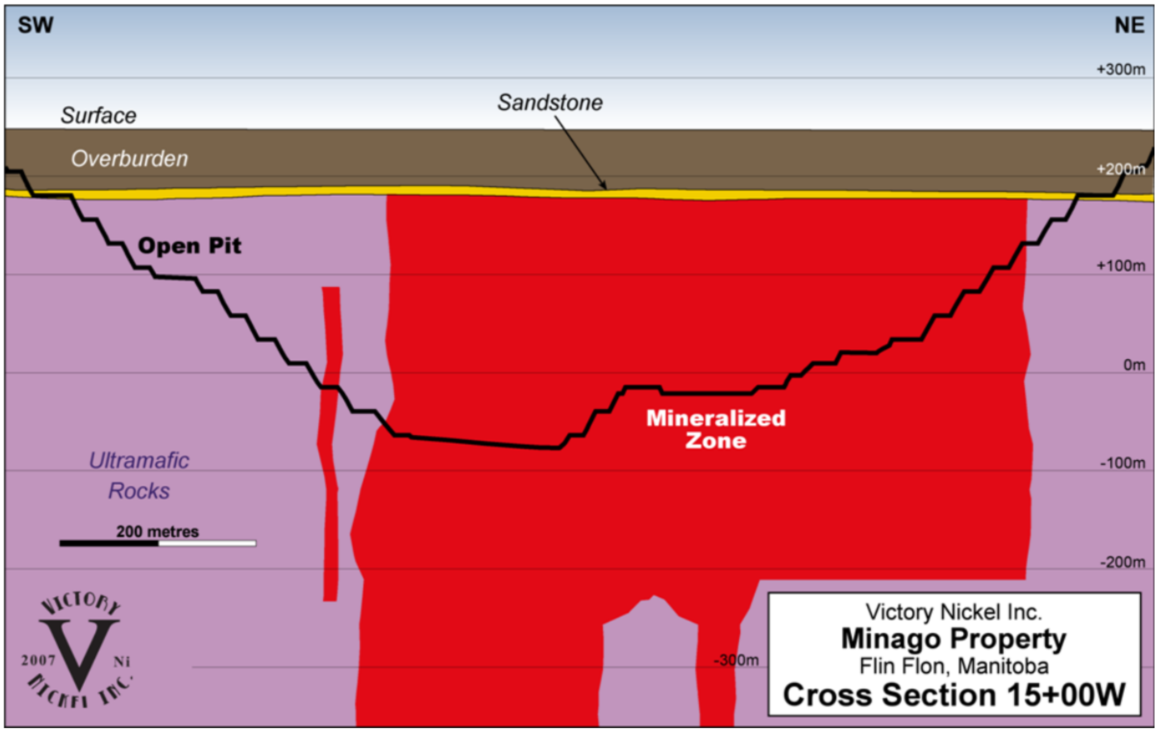

Chapter 6

Environmental Assessment Methodology

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6. ENVIRONMENTAL ASSESSMENT METHODOLOGY

6.1 Regulatory Context

The impact assessment methodology addresses the requirements of the *Manitoba Environment Act* and is consistent with the *Environment Act Proposal (EAP) Report Guidelines* for the proposed Project (MB Conservation, Information Bulletin – *Environment Act Proposal Report Guidelines*, March 2009). As outlined in the Guidelines, the regulatory requirements, also take into account socio-economic effects of the project, alternatives to the project, and alternative ways of undertaking the project, and it identifies follow-up programs. It is based on a systematic scoping of the Minago Project and its environmental, social, economic and cultural effects, based on consultation with community members, affected First Nations and government regulators, as well as scientific research and technical analyses. The assessment identifies all potential effects, but focuses in particular on representative valued ecosystem and cultural components (VECCs) that serve as sensitive indicators of project effects on the ecological, socio-economic and cultural environment. The general sequence and approach of the effects assessment are described in the following sections.

6.2 Scope of the Assessment and Select VECCs

Guidance on the scope of the assessment was provided in the *EA Proposal Report Guidelines* prepared by MB Conservation.

The scope of the assessment was further refined through correspondence and meetings with regulators and community members in the project area (Section 5). Environmental, socio-economic and cultural information for the project area (i.e., existing data and results of field surveys) was thoroughly reviewed and evaluated to define the scope of the assessment (Sections 7.1 through 7.14).

Project elements to be included in the assessment are given in detail in the *EA Proposal Report Guidelines*. This assessment examines all project components and phases listed at the feasibility stage level of design. Alternative designs and facility site locations are described along with the technical, economic and environmental rationale for the selection of preferred alternatives (e.g., infrastructure and access route locations). The *EA Proposal Report Guidelines* provided a list of environmental components and parameters, which guided the selection of VECCs for detailed analysis in this report. Based on the consultation process, traditional knowledge, technical information and the baseline studies, the list of VECCs was refined based on one or more of the following criteria:

- sensitive to project effects;
- important to local communities and resource users;

- important nationally or internationally (e.g., designated for specific management or protection measures by recognized national or international authorities);
- indicators of effects on related resources and broader systems (e.g., ecological, economic, social, and cultural); and
- key linkages in pathways between the project and effects on VECCs (e.g., sediment quality, benthic and periphyton communities).

Where possible, the evaluation of the project effects on VECCs is based on predicted changes in measurable parameters, and strives to characterize the effects of those changes on the long-term sustainability of the VECC.

The VECCs selected for assessment of the project are:

- Climate – temperature, precipitation, snowpack, wind, humidity, and solar radiation;
- Ambient air quality - particulate matter, SO_2, NO_X , CO, and greenhouse gases;
- Terrain, surficial geology and soils – key terrain features, surficial materials, soils with high erosion potential, terrain hazards, and sensitive soil types;
- Surface water hydrology – runoff, flood flows, low flows, evaporation, and snowmelt;
- Surface water quality – total suspended solids (TSS), pH, conductivity, alkalinity, sulphate, metals, and nitrogen compounds;
- Sediments – metals;
- Groundwater – quality (pH, conductivity, alkalinity, sulphate, metals, and nitrogen compounds) and flows;
- Periphyton – abundance (chlorophyll a) and species composition;
- Benthic invertebrates – abundance and species composition;
- Fish – fish habitat and metals in fish tissue;
- Vegetation – rare plants, uncommon vegetation communities, mature and old forests, wetland and riparian vegetation, productive berry producing areas (traditional use), productive forests, metals levels in vegetation;
- Wildlife – woodland caribou, moose, black bear, lynx/hare predator/prey relationship, marten, beaver, song bird community;
- Land use – settlement and transportation infrastructure, mineral and oil and gas activity, forestry and agriculture, non-traditional fishing and hunting, trapping, tourism and non-consumptive recreation, guide-outfitting, and protected areas;
- Heritage resources – historical, archaeological and paleontological sites;

- Socio-economic conditions – employment opportunities, contract and business opportunities, community health, traffic interruption/safety, and maintenance of traditional way of life.

6.3 Spatial and Temporal Boundaries of the Assessment

Temporal and spatial boundaries for the effects assessment are defined by the characteristics of the project and the VECC being assessed. These boundaries encompass time periods and areas during and within which the VECCs are likely to interact with or be influenced by the project. Spatial boundaries vary according to the nature of the VECC but generally are defined in terms of:

- a local study area (LSA), where project effects can be predicted with a reasonable degree of accuracy and confidence and impacts are likely to be most concentrated;
- a regional study area (RSA) where, depending on conditions (e.g., seasonal conditions, habitat use, more intermittent and dispersed project activities), project effects may be more wide reaching.

The definition of the RSA may take into consideration factors such as:

- habitat for sensitive life stages;
- wildlife migration routes and ranges;
- areas of potential effects from dispersed or intermittent project activities, such as, air transport, and road haul; and
- areas within which there is potential for cumulative effects with other projects.

Temporal boundaries for project-related effects are defined in terms of the project phases:

- baseline – covers ecological, physical and human-related characteristics of the environment, as characterized in 2006, 2007 and 2008, prior to the initiation of the construction phase;
- construction – includes all activities associated with project construction and before commencement of ore processing (mill start-up) such as:
  - ➢ transportation corridors construction;
  - ➢ mobilization of equipment and supplies to the site by road and air;
  - ➢ construction of mine site facilities, including camp, infrastructure, ore stockpile, mill, waste rock storage dump, TWRMF, water management facilities (diversions, settling ponds, seepage collectors etc.) and mining activities up to the commencement of ore processing;
  - ➢ camp operations and personnel transport during construction;

- operations – includes ongoing mining and processing of ore to produce concentrate, tailings disposal, water treatment plant operations and effluent disposal, operation of water management facilities, camp operations, transport of concentrate, transport of supplies and personnel;
- decommissioning – includes all activities to decommission mine site facilities and remove equipment and materials from the site, recontour the site and restore drainage patterns to stable long-term conditions, stabilize the mine and wastes (TWRMF and waste rock) for safe long-term maintenance, and implement the final site reclamation procedures to prevent erosion and restore vegetation cover where feasible;
- closure – refers to conditions that will exist on the site after the site is abandoned and revegetation is complete.

Temporal boundaries are also defined for the cumulative effects assessment, spanning baseline to a point in the future, within which project effects on VECCs are predicted to overlap with effects of other projects or activities. Spatial and temporal boundaries for each VECC are detailed in respective report sections.

6.4 Evaluation and Characterization of Residual Project Effects

Potential project impacts on each environmental component are identified for each project phase, as relevant. Mitigation measures to avoid or minimize impacts of these interactions are also identified. These measures may include:

- project design standards;
- generic environmental protection measures and protocols;
- site-specific measures (i.e., timing of activities in relation to local conditions, and site-specific impact mitigation procedures);
- contingency measures to address the possibility of unexpected or accidental events that could affect the environment.

Residual project effects on the environment are effects that are predicted to persist even when the prescribed mitigation measures are identified. These residual effects are characterized as fully as possible, for each project phase, based on:

- direction of effect, that is, positive, adverse, or neutral;
- magnitude of the effect, that is, the amount or proportion of a value, resource or species affected, quantified where possible in the context of the status or resilience of the VECC in the RSA;
- geographic extent of the effect, quantified where possible, to reflect the influence of geographic extent of the effect on sustainability of the VECC in the RSA;

- duration and frequency of the effect on the VECC, characterized where possible to reflect the influence of effect duration on sustainability of the VECC in the RSA;
- reversibility of the effect or the ability of the VECC to recover to pre-disturbance conditions during or following project activities;
- likelihood of occurrence, which is a characterization of the investigators confidence that the effect on the VECC will manifest as predicted, based on the status of scientific or statistical information, experience and/or professional judgement of the author;
- the ecological and social context of the effect, that is, a discussion of the ecological or social consequences of the predicted effect (e.g., Is a critical life stage of a species affected, or an important link in the food chain? Is there an effect on traditional activities?).

Where possible, documented quantitative thresholds describing levels of impact on VECCs (e.g., magnitude/extent/duration of disturbance that will displace animals from habitats or affect productive capacity; capacity of physical and social infrastructure of settlements affected by development) have been used to assess the relative levels of effects. Chapter 7 describes the assessment of effects of project facilities and routine activities on each VECC. Chapter 8: Accidents and Malfunctions describes the assessment of the effects of potential accidents and malfunctions.

6.5 Scope of the Cumulative Effects Assessment

Scoping of the cumulative effects assessment involves identification of other projects, activities or disturbance features in the vicinity of the project, including past, present and future projects, which may have effects that could combine with the residual project effects to increase the level of effect on VECCs. Past and present projects are identified from:

- historical records of activities;
- spatial information identifying existing disturbance features (clearing, ground disturbance, locations of facilities, roads and other linear disturbance features, etc.);
- traditional knowledge;
- current land tenures; and
- knowledge of ongoing activities (access development, and exploration activities).

Foreseeable future projects include existing activities known to be ongoing in future years (permanent roads, existing mines), or new projects that have embarked on a formal approval process (e.g., documentation or applications for permits or regulatory approvals have been submitted or a project description has been formally released).

Study areas for cumulative effects assessments are specific to each VECC and typically correspond to the RSA defined for each VECC. In some instances (e.g., wide ranging wildlife VECCs), additional areas may be considered to address potential cumulative effects on VECCs (e.g., wildlife migration routes).

6.6 Evaluation and Characterization of Cumulative Environmental Effects

The main question the cumulative effects assessment seeks to address is "will the project contributions to regional cumulative environmental effects have the potential to measurably change the health or sustainability of the resource in question?"

To provide some sense of scale regarding the project contributions to cumulative effects, the assessment compares:

- the additive effect of the project on VECCs in relation to the cumulative effects of development to date;
- the additive effect of the project in relation to the effects of development to date in combination with the effects of foreseeable future development.

Specific methods for assessment of cumulative effects on each VECC are provided in Chapter 7. Mitigation measures specific to management of cumulative effects, typically government led or jointly coordinated mitigation approaches applied at a regional level, are identified where appropriate.

6.7 Determination of Significance of Residual Project and Cumulative Effects

The significance of the residual project effects and contributions to the cumulative effects on VECCs and their sustainability over time is characterized as fully as possible building on the characterization of effects direction, magnitude, extent, frequency, reversibility, likelihood of occurrence, and ecological and social context. Where possible, quantitative thresholds describing levels of impact on VECCs are used to evaluate the significance of predicted effects (e.g., receiving water quality guidelines, documented average values and variability for environmental parameters, documented thresholds for core security habitat, road density affecting habitat suitability, design capacity of existing physical or social infrastructure, national averages for socio-economic indicators, etc.). Effects also are characterized in terms of compatibility with resource management objectives and priorities for the area. In addition, the professional judgement and experience of assessors is used to characterize the level of impact and effect on the sustainability of the affected component. Residual project effects and contributions to cumulative effects are described in terms of their influence in moving a VECC towards or past a sustainability threshold. The rationale and criteria for characterization of significance of impacts on each VECC are fully documented in the subsequent Chapters.

6.8 Monitoring and Follow-up Programs

Based on the findings of the assessments, the requirements for follow-up works to improve predictive capabilities or understanding of baseline conditions are identified. Monitoring programs will be implemented throughout the life of the project to evaluate the effectiveness of mitigation measures and guide subsequent management actions, which are also identified.

The project will also be subjected to the deleterious substances and effluent characterization and water quality and Environmental Effects Monitoring (EEM) as stipulated in the *Metal Mining Effluent Regulations* under the *Fisheries Act*.

The objective of the EEM program of the *Metal Mining Effluent Regulations* is to monitor effects of effluent on the aquatic environment. The goal of the EEM is to determine whether end-of-pipe limits are working to protect the aquatic environment by determining whether there is an effect; if the effect is mine-related; and whether the extent and cause of effects is known.

When properly designed and conducted, the EEM program will help Victory Nickel to:

- detect effects before damage to the environment occurs;
- reduce potential future liabilities;
- demonstrate due diligence; and
- obtain permits for amendments or expansions of operations.

The major components of the EEM program for the Minago Project will include, but not be limited to:

- regulatory liaison;
- data interpretation;
- review of baseline data to determine data required in order to develop programs for the future;
- site characterization, which leads to a sound study design by looking at the:
    - ➢ physical environment;
    - ➢ endangered species;
    - ➢ effluent and water quality;
    - ➢ habitat; and
    - ➢ resource use;
- study design with a goal to develop an EEM monitoring program.

After the above aspects are evaluated, Victory Nickel will design an EEM monitoring program. Victory Nickel will:

1. Set the objectives of the EEM program;
2. Develop a site-specific monitoring program; and
3. Liaise with Regulatory Agencies.

EEM components will include:

1. water and sediment quality, which will consist of sample collection and analysis of water quality, sediment quality (contaminant accumulation, and contaminant reflux), and effluent quality;
2. biological communities that will be assessed to:
   - identify species;
   - assess fish habitat (fisheries survey and fish tissue analysis);
   - examine benthic invertebrates (benthic invertebrate community survey);
   - examine fish health; and
   - test for toxicity (aquatic toxicity, and acute lethality and sub-lethal toxicity testing);
3. data interpretation, which is the key link between sampling and results, will help make good decisions based on sound data analysis and interpretation and quality assurance and quality control protocols.

For data interpretation, Victory Nickel will adhere to the following processes:

- organize data in a manageable way;
- apply appropriate statistical analyses;
- provide clear answers to determine effects, if any; and
- separate real effects from natural variation.

Victory Nickel will evaluate potential effects by:

- identifying Contaminants of Concern (COC);
- assessing impacts and risks of contaminants;
- recommending source control and treatment options; and
- reporting (interpretive report submission) to the respective governmental agencies to meet the *Metal Mining Effluent Regulations* (MMER) requirements.

Other aspects to be considered when developing an EEM are:

- All EEM studies will require consideration of site-specific conditions and concerns;
- Existing operational monitoring programs should be reviewed for the potential to ‘harmonize” the programs;
- Timing of studies will be dictated by the mine’s operations and conditions in the receiving environment;
- Historical data may allow relaxation of some monitoring requirements;
- Selection of sentinel fish species and appropriate reference sites are almost always an issue.

More detailed plans for these studies will be developed as the project moves into operations.